Industry and Country Effects in International Stock Returns

Implications for asset allocation.

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In the practice of international equity management, managers often use a two-stage approach to portfolio selection. In the first stage the manager allocates portions of the portfolio to several industries; in the second stage, the manager uses industry analysts to select the most attractive stocks from those sectors.

This strategy is used by managers who believe that international returns are predominantly driven by industry factors. Managers who believe that domestic market factors are more important for returns than industry factors decide on a country allocation first, then in the second stage select the most promising stocks from each country.

This article presents a simple model to measure country and industry effects in international stock returns, and provides a quantitative framework for analyzing these two approaches to portfolio selection.[1] We show that there are three reasons for portfolio managers to pay more attention to the geographical than to the industrial composition of an international portfolio. Each of these reasons is based on the finding that country effects in international stock returns are larger than industry effects.

First, tilting an international portfolio geographically leads, on average, to larger and more variable tracking errors than tilting the industrial composition of the portfolio. Second, stocks from the same domestic market but in different industries are closer substitutes than stocks from the same industry but in different countries. Finally, the benefits of international

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EXHIBIT 1
Number of Firms by Country and Industry

Country	Industry							
	Basic Industries	Capital Goods	Consumer Goods and Services	Energy	Finance, Insurance, and Real Estate	Transportation and Storage	Utilities	Total
Austria	9	2	3	1	7	1	1	24
Belgium	16	---	3	1	9	1	8	38
Denmark	2	3	14	---	10	5	1	35
France	16	17	46	4	29	1	2	115
Germany	27	17	22	1	18	3	3	91
Italy	19	11	19	3	26	2	5	85
Netherlands	7	4	10	1	7	3	---	32
Norway	6	9	10	1	9	5	---	40
Spain	14	2	11	2	12	2	9	52
Sweden	26	11	13	---	5	---	---	55
Switzerland	9	11	31	---	19	3	---	73
United Kingdom	35	36	49	9	38	4	18	189
Europe	186	123	231	23	189	30	47	829

diversification stem largely from geographical diversification and not from industrial diversification.

DATA

The sample consists of monthly total returns for all 829 firms that were included in the Morgan Stanley Capital International (MSCI) country indexes of twelve European countries from 1978 through 1992. Country assignments for each firm are based on the country classifications of MSCI. Each firm is assigned to one of seven broad industry categories, as defined by the *Financial Times Actuaries*. The distribution of firms over countries and industries is given in Exhibit 1.

If a firm is dropped from the MSCI indexes, but remains listed on an exchange, it is kept in the sample. All returns are converted into deutschemarks using exchange rates taken from the *Financial Times*.

MODEL

The model assumes that we can write the return on a stock i that belongs to industry j and country k as follows:

$$R_{it} = \alpha_t + \beta_{jt} + \gamma_{kt} + e_{it} \qquad (1)$$

Equation (1) states that all returns share a common factor α. β_j is the industry effect for industry j, γ_k is the country effect for country k, and e_i is a firm-specific component of the return in period t. For each month in the sample, we estimate α, β, and γ by running a cross-sectional regression of the returns of all 829 firms in our sample on a set of industry and country dummies:

$$R_i = \alpha + \beta_1 I_{i1} + \beta_2 I_{i2} + \ldots + \beta_7 I_{i7} + \gamma_1 C_{i1} + \gamma_2 C_{i2} + \ldots + \gamma_{12} C_{i12} + e_i \qquad (2)$$

where $I_{ij} = 1$ if firm i belongs to industry j (zero otherwise), and $C_{ik} = 1$ if firm i belongs to country k (zero otherwise). By running a cross-sectional regression for each month we obtain a time series of estimated industry and country effects.

The only complication in estimating Equation (2) is that there is perfect multicollinearity among the regressors. The problem is that every firm belongs to both an industry and a country, and therefore we can measure only differences between countries and differences between industries. To get around this problem, we choose to measure industry and country effects relative to the common factor, which is the European equally weighted (EW) index.

Each of the estimated industry effects, β_j, can be interpreted as the excess return over the European EW index on a portfolio that invests in industry j, and has no net position in other industries. This industry port-

EXHIBIT 2
Industry and Country Effects 1978-1992
(monthly returns expressed in % per year)

	Mean	Standard Deviation
Industry Effects		
Basic Industries	−0.36	4.03
Capital Goods	−3.20	4.74
Consumer Goods	1.50	3.01
Energy	3.00	14.56
Finance	−0.64	3.86
Transportation	0.40	8.41
Utilities	1.32	10.51
Average Absolute Value	1.49	7.02
Country Effects		
Austria	−5.05	20.29
Belgium	0.79	12.37
Denmark	−1.63	16.96
France	2.98	15.07
Germany	−3.41	11.29
Italy	3.29	20.52
Netherlands	−0.26	13.67
Norway	−5.27	20.55
Spain	−0.15	23.17
Sweden	4.96	20.23
Switzerland	−5.85	11.24
United Kingdom	2.39	13.12
Average Absolute Value	3.00	16.54

folio is geographically diversified in the sense that it has the same country composition as the European EW index, and is therefore a pure industry bet. Similarly, γ_k is the excess return of an industrially diversified investment in country k, and represents a pure country play.

Because the portfolio weights of these industry and country bets depend only on the industry and country assignments of the stocks, which are known at the beginning of each period, the βs and γs are excess returns on feasible investment strategies.

RELATIVE SIZE OF COUNTRY AND INDUSTRY EFFECTS

Exhibit 2 gives the mean and standard deviation, expressed in percent per year, of the industry and country effects. The first row of the table indicates that the average portfolio of stocks in basic industries with the same country composition as the European EW index underperformed the European index by 0.36% per year with a standard deviation of 4.03% per year.

The striking feature of Exhibit 2 is that the absolute value of the country effects is on average twice as large as the absolute value of the industry effects. The average standard deviation of the country effects is more than twice the average standard deviation of the industry effects. Except for the energy sector, the standard deviations of the industry effects are all smaller than the standard deviations of the country effects.

The relative size of country and industry effects is important for portfolio managers because these effects have the interpretation of tracking errors relative to the European index. Suppose a manager uses the European index as the benchmark, and considers either a 10% country tilt toward the U.K. or a 10% industry tilt toward the financial sector. Because the financial sector and the U.K. each contribute 189 securities to the sample, these tilts are in that sense equally diversified.

The country effect for the U.K. indicates that replacing 10% of the stocks in the European index portfolio with U.K. stocks, while maintaining the industry composition of the portfolio, would have led to outperformance of the benchmark by $10\% \times 2.39 = 0.239\%$ per year, with a standard deviation of the tracking error of $10\% \times 13.12 = 1.312\%$ per year. A 10% tilt toward the financial sector would have led to underperformance of the European index by 0.06% per year with a standard deviation of only 0.39%.

Because country effects are larger than industry effects, a deviation from the country composition of the benchmark portfolio while maintaining the industry composition will induce much larger tracking errors than tilting a portfolio toward a different industry, holding the country composition fixed.[2]

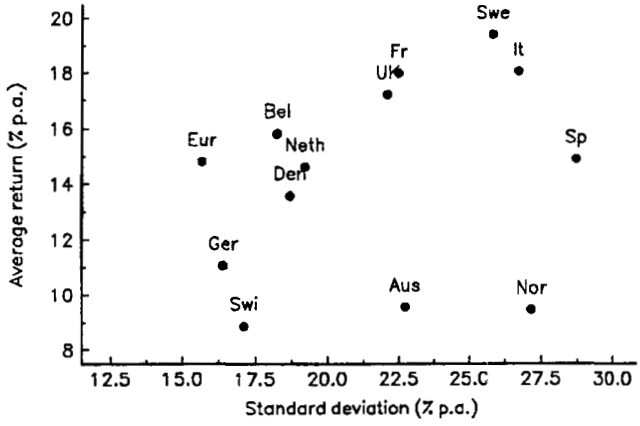
Firms in different industries but located in the same country share the common factor and the country effect, while firms in the same industry but in different countries share the common factor and the industry effect. Because the variance of the country effect is larger than the variance of the industry effect, the average correlation between securities within a country is higher than the average correlation between firms that are in the same industry. In other words, two firms that are located in the same country are closer substitutes than two firms that belong to the same industry.

EXPLAINING COUNTRY PERFORMANCE

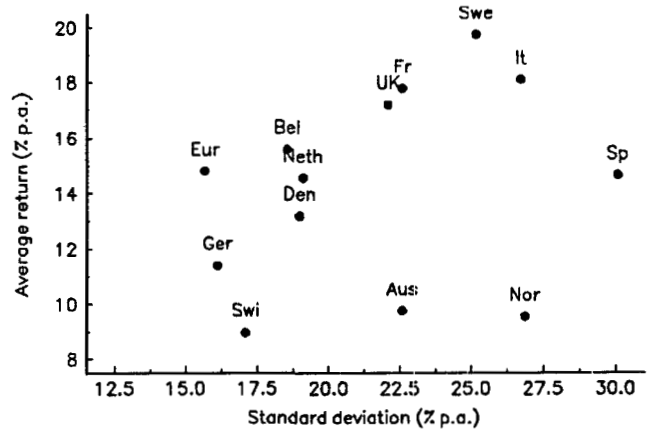
The model is particularly useful in explaining

EXHIBIT 3
DECOMPOSITION OF COUNTRY INDEX RETURNS INTO INDUSTRY AND COUNTRY EFFECTS

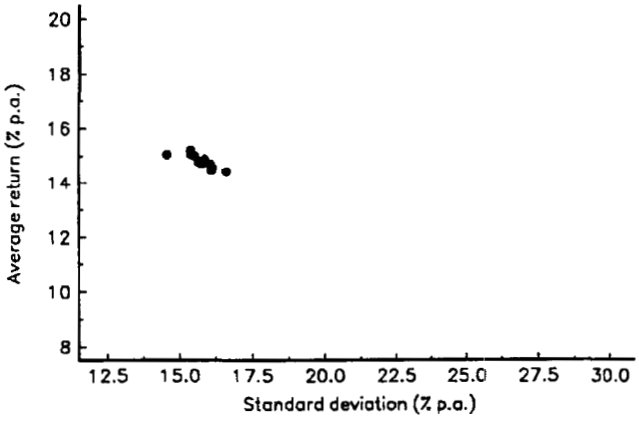
PANEL A. EQUALLY WEIGHTED COUNTRY INDEX RETURNS IN DM 1978-1992



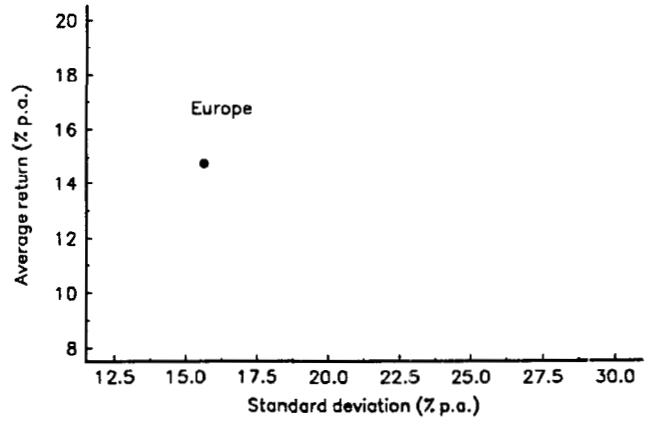
PANEL B. COMMON FACTOR + COUNTRY EFFECT



PANEL C. COMMON FACTOR + INDUSTRY EFFECTS



PANEL D. COMMON FACTOR EUROPEAN EQUALLY WEIGHTED MARKET



differences in country performance. Summing the individual returns by country, we can write the return on the equally weighted market of country k as the sum of three components: the common factor, the average of the industry effects of the stocks in the index, and a country effect:

$$R_k^{ew} = \hat{\alpha} + \frac{1}{n_k}\sum_{i=1}^{n_k}\sum_{j=1}^{7}\hat{\beta}_j I_{ij} + \hat{\gamma}_k \qquad (3)$$

Common Factor | Industry Effects | Country Effect

where n_k is the number of stocks in country k.

Because all countries share the common factor (α), there are two reasons for differences in country performance. The first factor is that countries specialize in different industries, and are therefore subject to a different set of industry effects. This is measured by the second term on the right-hand side of Equation (3). For example, Exhibit 2 shows that the utilities sector has a positive and capital goods a negative industry effect. Both have a positive effect on the relative performance of Spain, because Spain has proportionally more utilities than other countries, and fewer firms in the capital goods sector (see Exhibit 1).

The second factor driving country performance is the country effect, given by the last term in Equation (3). It measures the part of the performance of Spanish firms relative to firms in the same industry but located

outside Spain. It controls for the fact that Spain has proportionally more firms in sectors that performed well (utilities), and fewer firms in industries that performed poorly (capital goods).

The four panels of Exhibit 3 give a graphical view of this decomposition in terms of the means and standard deviations of the country returns. The sample means and standard deviations of returns of the twelve European countries during 1978-1992 are given in Panel A. Panel D plots the mean and standard deviation of the common factor. The horizontal difference between two panels illustrates the role of industry effects; the vertical difference represents the country effects.

Panel A can be obtained from Panel D by adding to the common factor the country effects (D ⇒ B) and the industry effects (B ⇒ A), or by adding the industry effects first (D ⇒ C) and the country effects next (C ⇒ A). Either way, the decomposition shows that cross-country differences in average return and return volatility are primarily due to country factors. Industry factors cannot account for the differences in the mean and volatility of county index returns.

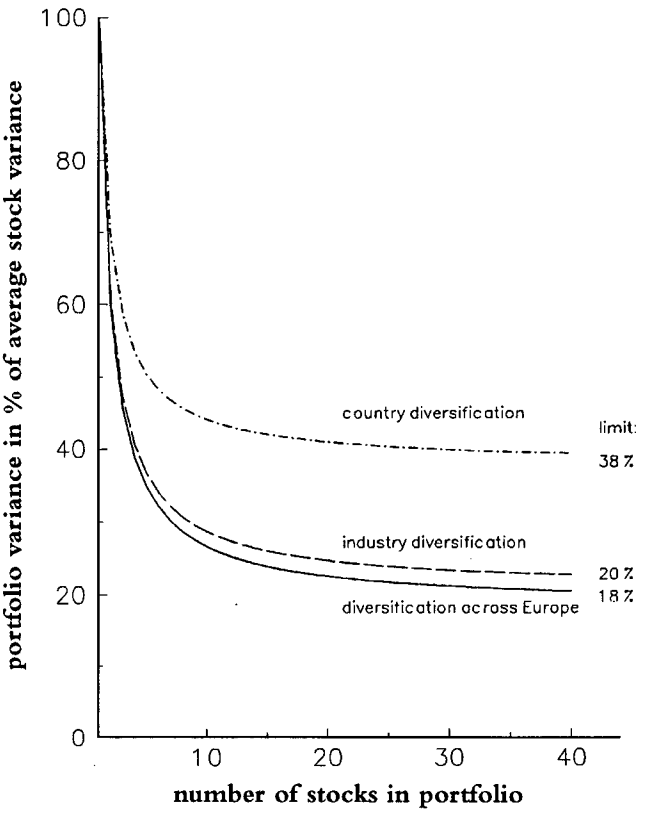
These results are surprising in the sense that we find large country effects in a sample where one would expect them to be relatively unimportant, because the European countries are economically and financially integrated, yet industrially diverse. We conjecture that country effects will play an even larger role in a sample that also includes the U.S. and Japan, or a number of emerging markets.

THE BENEFITS OF INTERNATIONAL DIVERSIFICATION

By selecting international stocks, a portfolio manager achieves risk reduction through the benefits of both geographical and industrial diversification. When building portfolios, however, it is more important to be geographically diversified than to be industrially diversified. This is shown in Exhibit 4, which compares the variance reduction that can be achieved by three different strategies.[3]

The top line plots the average variance of a strategy that diversifies across industries within a country, as a function of the number of stocks in the portfolio. This strategy is well-diversified industrially but not geographically. As the number of stocks in the portfolio becomes large, the portfolio variance becomes 38% of the average variance of the securities in the portfolio.

EXHIBIT 4
BREAKDOWN OF THE BENEFITS OF INTERNATIONAL DIVERSIFICATION



The strategy that corresponds to the second line chooses stocks from a single industry, but is well-diversified across countries. For large portfolios, the average portfolio variance is approximately 20% of the variance of the typical stock in the portfolio. A large portfolio that simultaneously diversifies over industries as well as countries has a variance of 18% of the typical security variance.

Because we merely allocate the same securities into portfolios according to different criteria, the average return of all three strategies is the same. Hence, the vertical difference between the lines is an estimate of the average difference in the diversifiable risk of these portfolio strategies. The figure therefore shows that geographical diversification is a much more effective tool for risk reduction than industrial diversification.

SUMMARY AND CONCLUSIONS

We have presented a simple method to measure the importance of industry and country effects in international stock returns. We show that, for twelve

European countries that are in many respects similar in terms of economic policies, country effects dominate industry effects. Consequently, the performance of international portfolios is largely country-driven, and international portfolio managers should pay more attention to the geographical composition than to the industrial composition of their portfolios.

ENDNOTES

The authors thank Richard Lindsey and Roberto Wessels for comments, and ARCAS-Wessels Roll Ross for making the data available.

[1]The analysis is in the spirit of Grinold, Rudd, and Stefek [1989]. The framework we develop is equally useful to managers who do not explicitly use either of these two-stage approaches, because country and industry allocation is an issue in the construction of any international portfolio.

[2]These conclusions are qualitatively similar if we choose the value-weighted European index as a benchmark. A complete discussion of these results is found in Heston and Rouwenhorst [1994].

[3]This figure was first suggested by Solnik [1974].

REFERENCES

Grinold, Richard, Andrew Rudd, and Dan Stefek. "Global Factors: Fact or Fiction?" *Journal of Portfolio Management*, 16 (1989), pp. 79-88.

Heston, Steven L., and K. Geert Rouwenhorst. "Does Industrial Structure Explain the Benefits of International Diversification?" *Journal of Financial Economics*, 36 (1994), pp. 3-27.

Solnik, Bruno. "Why Not Diversify Internationally Rather Than Domestically?" *Financial Analysts Journal*, 30 (1974), pp. 48-54.